Remarks

The Examiner is thanked for the Office Action mailed 10/03/2002 (request for 2-month extension to respond enclosed). Claims 1-5 have been canceled in the present application. Other of claims 6-20 have been amended in an attempt to improve their clarity even further although no substantive amendment has been made to those claims.

With regard to the drawing objections a separate letter to the Official Draftsperson is enclosed with a new first page of the drawings correcting the informalities noted with regard to FIGS. 2 & 3.

Restriction Requirement

In the Action the Examiner first raised a restriction requirement between the following Groups as identified by the Examiner: Group I (claims 1-20); Group II (claims 21-34); and Group III (claims 35-39). The provisional election of Group I (claims 1-20) is confirmed, with traverse.

In particular, the over-riding consideration for any restriction requirement is provided by M.P.E.P. 803 as:

> There are two criteria for a proper requirement for restriction between patentably distinct inventions:
>
> (A) The inventions must be independent (see **MPEP § 802.01, § 806.04, § 808.01**) or distinct as claimed (see **MPEP § 806.05 - § 806.05(i)**); and
>
> (B) There must be a serious burden on the examiner if restriction is required (see **MPEP § 803.02, § 806.04(a) - § 806.04(i), § 808.01(a),** and **§ 808.02**).

In the present case, the apparatus of Group II and the computer program product of Group III can be used to perform the methods of Group I (indeed, they are

specifically adapted to perform such methods). Accordingly, in order to properly search and examine the methods of Group I the Examiner should in any event consider the art and claim limitations also relevant to Groups II and III. Thus, there is no "serious burden" on the Examiner by considering Groups II and III together in the same application as Group I (indeed, there is very little or no additional burden over considering Group I alone). Accordingly, the restriction requirement should be withdrawn.

Before discussing the claim rejections, it is useful to bear in mind that in conventional chemical array reading techniques one line would be illuminated by scanning a spot along it. The spot would then be moved to a next line and scanned along that line. This procedure would be repeated in either of the ways shown in FIGS. 6 or 7 of the present application. In such conventional scanning methods the order of those lines in space (spatial order) is the same as their order in time (temporal order). Specifically, in FIGS. 6 or 7 the lines 70a, 70b, 70c, 70d appear in that order in space (spatial order) and are also illuminated in that order in time (temporal order). That is, conventionally the spatial and temporal order of illumination <u>are the same</u>. However, as pointed out on page 10, lines 21-31 of the present application, one of the things recognized by the present invention is that such conventional reading techniques can lead to a substantial proportion of the illuminated chemical species being lost to triplet saturation and therefore producing no signal or a varying signal (triplet saturation during fluorescence in general is a known phenomena and is also discussed on page 2, line 25 to page 3, line 10). In distinction from the conventional illumination, the present invention provides that spatial order and temporal order of illumination <u>are not the same</u>. For example, the order in space of the illuminated lines in FIG. 8 is 70a, 70c, 70e, 70g, 70i, 70b etc., while their order in time is 70a, 70b, 70c, 70d, 70e, 70f, etc. This is discussed in more detail on, for example, page 11, lines 9-12 and 16-22 of the present application.

Rejections under 35 U.S.C. 112, Second Paragraph (Indefiniteness)

Turning now to the rejections, the Examiner first raised several 35 U.S.C. 112, second paragraph rejections on the basis that the claims were indefinite. First, on the question of what is required by 35 USC § 112, second paragraph, the Federal Circuit's discussion in Miles Laboratories Inc. v. Shandon Inc. 27 USPQ 1123 @ 1126 (Fed.Cir. 1993) is instructive:

> "The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. *Orthokinetics*, 806 F.2d at 1576. If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, § 112 demands no more. *Hybritech*, 802 F.2d at 1385. The degree of precision necessary for adequate claims is a function of the nature of the subject matter. *Id.*"

Further, M.P.E.P. § 2173 outlines the same approach when considering the second paragraph of 35 USC § 112.

In paragraph 8a of the Action the Examiner first rejected claims 1-5, 8-20 on the basis of "what is meant by "later illuminated location", "spatially closer", "a temporally intervening illuminated location" and "on a same line"". Claims 1-5 have been canceled. With regard to "temporally" in claim 8 note that Merriam-Webster's On Line Dictionary (**www.merriam.com**) defines "temporal" as:

> Main Entry: [1]tem·po·ral
> 1 a : of or relating to time as opposed to eternity b : of or relating to earthly life c : lay or secular rather than clerical or sacred : CIVIL <lords *temporal*>
> 2 : of or relating to grammatical tense or a distinction of time
> 3 a : of or relating to time as distinguished from space b : of or relating to the sequence of time or to a particular time : CHRONOLOGICAL
> - tem·po·ral·ly *adverb*

Thus while it is believed claim 8 at least "reasonably apprises" one of the scope of the claimed invention, claim 8 has been amended in an attempt to further clarify the claim by now reciting:

> "at least one later illuminated path is closer to an earlier illuminated path than a path illuminated at a time between the later and earlier illuminated paths".

The foregoing language at the very least "reasonably apprises" one skilled in the art of the scope of the claim as required by Miles Laboratories. With regard to "later illuminated path" one of skill in the art is at the very least "reasonably apprised" that such a path is illuminated later than the recited "earlier illuminated path". The phrase "spatially closer" does not appear in claims 8-20 although claim 8 does recite "closer" which is normally understood to be closer in spatial position (versus position in time). The questioned phrase "on a same line" also does not appear in claims 8-20.

Accordingly, in view of the above the rejections of paragraph 8a should now be withdrawn.

In paragraph 8c of the Action the Examiner also stated that "path" in claims 6, 7 was indefinite in terms of illumination. Merriam-Webster's On Line Dictionary defines "path" as:

> Main Entry: path
> 1 : a trodden way
> 2 : a track specially constructed for a particular use
> 3 a : COURSE, ROUTE b : a way of life, conduct, or thought
> 4 a : the continuous series of positions or configurations that can be assumed in any motion or process of change by a moving or varying system b : a sequence of arcs in a network that can be traced continuously without retracing any arc
> 5 : PATHWAY 2

Thus, by definition a "path" can be a continuous series of locations. Further, as described in the present application, a "path" may be (but not necessarily is) a line (see, for example, page 3, lines 28-30). The series of locations on a path such as a line may be illuminated by scanning a light beam across them (see, for example, page 4, lines 7-9 of the present application) or they may be illuminated simultaneously such as by a line of light (see, for example, page 16, lines 3-6 of the present application). Given the above definition and the foregoing description

in the specification one of skill in the art would at the very least be "reasonably apprised" of the scope of these claims. In an effort to make the foregoing characteristics of a "path" even more clear in the claims though without changing them substantively, claim 6 has been amended to recite:

> "illuminating multiple paths across the array, each path being a continuous series of locations"

In paragraph 8c of the Action the Examiner also questioned what is meant by the language "the paths extend in a same lengthwise direction and are spaced from one another in a crosswise direction". Merriam-Webster's On Line Dictionary defines "lengthwise" as follows:

> Main Entry: length·wise
> : in the direction of the **length** : LONGITUDINALLY
> - lengthwise *adjective*

That dictionary also defines "crosswise" as:

> Main Entry: [2]crosswise
> Function: *adjective*
> Date: 1903
> : TRANSVERSE, CROSSING

Similarly, "transverse" is defined as:

> Main Entry: [1]trans·verse
> 1 : acting, lying, or being across : set crosswise
> 2 : made at right angles to the anterior-posterior axis of the body <a *transverse* section>
> - trans·verse·ly *adverb*

Thus, given the above definitions the phrase "the paths extend in a same lengthwise direction and are spaced from one another in a crosswise direction" references paths which have their length in a same direction and are spaced from one another in a direction lying across the lengthwise direction. One example of

such a configuration is the parallel lines of claim 7. Therefore, one of skill in the art is at the very least "reasonably apprised" of the scope of claim 6. Similarly, with regard to claim 7 the paths are stated to be "parallel lines". These also are dictionary words and one of skill in the art therefore is at the very least "reasonably apprised" of their scope.

In paragraph 8c the Examiner also stated that the phrase "the spatial sequence of the paths does not correspond to their temporal sequence". As pointed out above, all of the foregoing words are dictionary words and hence one of skill in the art is at least "reasonably apprised" of the scope of the claim. However, in an effort to make claim 8 even more clear without changing it substantively, claim 8 has been amended to further clarify that claim by reciting:

> "and the spatial order of the paths in the crosswise direction is not the same as their order in time"

Given the above it is submitted that the rejections of claims 6 and 7 in paragraph 8c of the Action should now be withdrawn.

In paragraph 8b of the Action the Examiner stated that claim 17 is vague and indefinite because it was unclear how the language "a saturation characteristic of a fluorophore producing the fluorescence" is defined in the specification (note: the Examiner omitted the underlined "a" in the foregoing). However, page 12, lines 32-33 specifically define "saturation characteristic" as follows:

> "saturation characteristic (that is, what proportion will be excited to a triplet state and the rate of return therefrom to the ground state) of a fluorophore producing the fluorescence"

Accordingly, given this definition this rejection of claim 17 should be withdrawn.

In paragraph 8d of the Action the Examiner rejected claim 20 on the basis that "a pixel size" has no antecedent basis. This rejection is not understood. Such

a rejection would might have been proper if the claim had recited "the pixel size" (and "pixel size" was not previously mentioned). However, since claim 20 introduces pixel size for the first time it properly recites "a pixel size". Furthermore, "pixel" and "size" in relation to a pixel are dictionary terms with very well understood meaning. Furthermore, pixels and examples of detection from them are discussed, for example, on: page 7, lines 1-3; page 9, line 20 to page 10, line 11; page 10, line 32 to page 11, line 2. Accordingly, one of skill in the art is certainly at least "reasonably apprised" of the scope of claim 20, and the present rejection should therefore be withdrawn.

In paragraph 8e of the Action the Examiner next rejected claims 11 and 12 on the basis that "it is not really clear" what is the difference between these terms". Timewise sequence means in order of time whereas spatial sequence means in order in space. In an effort to make this even more clear in claims 11 and 12, claim 11 has been amended to recite:

"an order in time which is different from their spatial order"

Given that these are all dictionary defined words and given the discussion in the specification regarding how the present invention discloses how the spatial and temporal order of illuminating are not the same (discussed already above), it is submitted that one of skill in the art is more than "reasonably apprised" of the scope of claims 11 and 12. Accordingly, the present rejection should be withdrawn.

Rejection under 35 U.S.C. 102 (Anticipation)

The Examiner rejected claims 1-17 and 20 under 35 U.S.C. 102(b) as being anticipated by Dorsel et al. (US 5,837,475). Claims 1-5 have been canceled hence only claims 6-17 and 20 will be discussed. Claims 6, 8 and 13 are the only

independent claims of this group. As the Examiner is aware, in order to establish a case of anticipation she has the burden of pointing to every claim element in the cited reference.

One difference between Dorsel et al and claims 6, 7 is that those claims require that multiple lengthwise extending paths be illuminated (each path recited to be a continuous series of locations and the paths spaced in a crosswise direction). An example of those paths are the parallel lines of claim 7. Those claims also require that the spatial order of the paths in the crosswise direction is not the same as their order in time. Dorsel et al. discloses a technique whereby one selects a set of less than all pixels in an array, irradiates this set of pixels sequentially (steps 306, 310 in FIG. 3 of Dorsel et al.), repeats the foregoing irradiation (step 314, 318) then selects other sets of pixels (step 322) for the same procedure. The Examiner in referencing column 2, lines 47-48 and column 3, lines 1-5 of Dorsel et al. states that there must be temporally intervening illuminate paths. While this is true (and indeed is true of the conventional scanning configurations of FIGS. 6 and 7 shown and described in the present application), this is not a disclosure of all claim elements. Specifically, as pointed out claims 6 and 7 also require that the spatial order of the paths in the crosswise direction is not he same as their order in time. In the portions of Dorsel et al. relied upon by the Examiner nothing is stated which indicates that the spatial order of the paths is different from their order in time. Similarly, claim 8 requires:

> "at least one later illuminated path is closer to an earlier illuminated path than a path illuminated at a time between the later and earlier illuminated paths"

While claim 13 requires:

> "a later illuminated line is closer to an earlier illuminated line than a line illuminated at a time between the later and earlier illuminated lines"

Again, nothing in the portions of Dorsel et al. relied upon by the Examiner or elsewhere discloses that the paths, or lines, should have a spatial order different from their temporal order. Thus, since the Examiner has not pointed to a disclosure of all the presently claimed features in the cited reference, the present rejection of claims 6-17, 20 should be withdrawn.

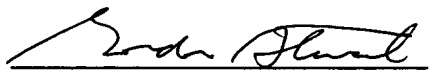
Furthermore, even if it could be argued that it was possible that Dorsel et al. method might have used illuminated paths or lines with different spatial and temporal orders, this does not amount to inherency under 35 U.S.C. 102. This has been clearly stated by the Federal Circuit in, for example, In re Robertson 49 USPQ2d 1949 (CAFC, 1999) @ 1950-1951:

> "If the prior art reference does not expressly set forth a particular element of the claim, that reference still may anticipate if that element is "inherent" in its disclosure. To establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." Continental Can Co. v. Monsanto Co., 948 F.2d 1264, 1268, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." Id. at 1269, 20 U.S.P.Q.2d at 1749 (quoting In re Oelrich, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981)."

Since the Examiner has not established that the presently claimed invention with the paths, or lines, having a spatial order different from their temporal order is necessarily present in Dorsel et al., inherency has not been established.

In view of the above, it is believed that claims 6-20 as amended, are now in condition for allowance. If the Examiner is of the view that there are any outstanding issues which might be resolved by means of a telephone conference, she is invited to call Gordon Stewart at (650)485-2386.

Respectfully submitted,

By: 
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Dated: 03/03/2003

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APPENDIX

Showing All Claim Amendments Now Being Made

~~1. A method of reading fluorescence signals from an array of chemical moieties, comprising:~~

~~illuminating multiple locations on the array and detecting any resulting fluorescence, wherein a later illuminated location is spatially closer to an earlier illuminated location than is a temporally intervening illuminated location lying on a same line as the later and earlier illuminated locations.~~

~~2. A method according to claim 1 wherein the chemical moieties are polynucleotides.~~

~~3. A method according to claim 2 wherein the chemical moieties are different DNA sequences.~~

~~4. A method according to claim 1 wherein at least one later illuminated location is interleaved between previously illuminated locations.~~

~~5. A method according to claim 4 additionally comprising selecting a time between illuminating a location and illuminating a closest later illuminated location based on a saturation characteristic of a fluorophore producing the fluorescence.~~

6. (AMENDED) A method of reading fluorescence signals from an array of chemical moieties, comprising:

illuminating multiple paths across the array, each path being a continuous series of locations, and detecting any resulting fluorescence, wherein the paths extend in a same lengthwise direction and are spaced from one another in a crosswise direction, and the spatial ordersequence of the paths in the crosswise direction does not correspond to is not the same as their temporal sequence order in time.

7. A method according to claim 6 wherein the paths are parallel lines.

8. (AMENDED) A method of reading fluorescence signals from an array of chemical moieties, comprising:

illuminating multiple paths across the array, each path being a continuous series of locations, and detecting any resulting fluorescence, wherein the paths extend in a same lengthwise direction and are spaced from one another in a crosswise direction, and at least one later illuminated path is closer to a an earlier illuminated path than a temporally intervening illuminated path illuminated at a time between the later and earlier illuminated paths.

9. A method according to claim 8 wherein the at least one later illuminated path is interleaved between previously illuminated paths.

10. A method according to claim 9 wherein multiple later illuminated paths are interleaved between previously illuminated paths.

11. (AMENDED) A method according to claim 10 wherein the later illuminated paths are illuminated in an ~~timewise sequence~~ order in time which is different from their spatial order in the crosswise direction~~sequence such that a spatially nearest neighbor in a later illuminated path is not a timewise nearest neighbor~~.

12. (AMENDED) A method according to claim 11 wherein the spacing between the ~~nearest paths of the~~ earlier, ~~temporally~~ intervening in time, and later~~interleaved~~ paths are equal.

13. (AMENDED) A method of reading fluorescence signals from an array of chemical moieties, comprising:

illuminating multiple parallel lines across the array and detecting any resulting fluorescence, wherein a later illuminated line is closer to an earlier illuminated line than a ~~temporally intervening illuminated~~ line illuminated at a time between the later and earlier illuminated lines.

14. A method according to claim 13 wherein multiple later illuminated lines are interleaved between previously illuminated lines.

15. (AMENDED) A method according to claim 14 wherein the spacing between nearest lines of the earlier, ~~temporally~~ intervening and ~~interleaved~~ later illuminated lines is equal.

16. (AMENDED) A method of claim 13 additionally comprising repeating the illuminating in one or more further cycles, and wherein ~~timewise successively illuminated~~ lines which are successively illuminated in time during~~of~~ a cycle are illuminated by scanning a light beam in opposite directions.

17. A method according to claim 13 additionally comprising selecting a time between illuminating a line and illuminating a spatially closest later illuminated line based on a saturation characteristic of a fluorophore producing the fluorescence.

18. A method according to claim 13 additionally comprising selecting a time between illuminating a line and illuminating a spatially closest later illuminated line based on an identifier associated with the array.

19. A method according to claim 18 wherein the identifier is carried on an array substrate or a housing for the array.

20. A method according to claim 13 additionally comprising selecting a time between illuminating a line and illuminating a spatially closest later illuminated line based on a spatial distribution of the illumination and a pixel size during the detecting.

21. An apparatus for reading fluorescence signals from an array of chemical moieties, comprising:

(a) an illumination source to cause fluorescence of the chemical moieties;

(b) a scan system to direct the illumination source to different locations on the array; and

(c) a detector to detect any resulting fluorescence from the array;

(c) a processor which controls the scan system such that multiple locations on the array are illuminated and any resulting fluorescence detected, wherein a later illuminated location is spatially closer to an earlier illuminated location than is a temporally intervening illuminated location lying on a same line as the later and earlier illuminated locations.

22. An apparatus according to claim 21 wherein at least one later illuminated location is interleaved between previously illuminated locations.

23. An apparatus according to claim 21 wherein the processor additionally selects a time between illuminating a line and illuminating a spatially closest later illuminated line based on a saturation characteristic of a fluorophore producing the fluorescence

24. An apparatus for reading fluorescence signals from an array of chemical moieties, comprising:

(a) an illumination source to cause fluorescence of the chemical moieties;

(b) a scan system to direct the illumination source to different locations on the array; and

(c) a detector to detect any resulting fluorescence;

(c) a processor which controls the scan system such that multiple paths across the array are illuminated and any resulting fluorescence detected, wherein the paths extend in a same lengthwise direction and are spaced from one another in a crosswise direction, and the spatial sequence of the paths does not correspond to their temporal sequence.

25. An apparatus according to claim 24 wherein at least one later illuminated path is closer to a an earlier illuminated path than a temporally intervening illuminated path.

26. An apparatus according to claim 25 wherein timewise successively illuminated paths are equally spaced crosswise from their respective closest later illuminated paths.

27. An apparatus according to claim 25 wherein at least one later illuminated path is interleaved between previously illuminated paths.

28. An apparatus according to claim 27 wherein multiple later illuminated paths are interleaved between previously illuminated paths.

29. An apparatus for reading fluorescence signals from an array of chemical moieties, comprising:

(a) an illumination source to cause fluorescence of the chemical moieties;

(b) a scan system to direct the illumination source to different locations on the array; and

(c) a detector to detect any resulting fluorescence from the array;

(c) a processor which controls the scan system such that multiple parallel lines across the array are illuminated and any resulting fluorescence detected, wherein a later illuminated line is closer to an earlier illuminated line than a temporally intervening illuminated line.

30. An apparatus according to claim 29 wherein multiple later illuminated lines are interleaved between previously illuminated lines.

31. An apparatus according to claim 30 wherein the spacing between the interleaved and previously illuminated lines is equal.

32. An apparatus of claim 29 additionally comprising repeating the illuminating in one or more further cycles, and wherein timewise successively illuminated lines of a cycle are illuminated by scanning a light beam in opposite directions.

33. An apparatus according to claim 29 wherein the processor additionally selects a time between illuminating a line and illuminating a spatially closest later illuminated line based on a saturation characteristic of a fluorophore producing the fluorescence.

34. An apparatus according to claim 29 wherein the processor additionally selects a time between illuminating a line and illuminating a spatially closest later illuminated line based on a spatial distribution of the illumination and a pixel size during the detecting.

35. A computer program product, comprising: a computer readable storage medium having a computer program stored thereon which, when loaded into a computer communicating with an apparatus for reading fluorescence signals from an array of chemical moieties, performs the steps of:

illuminating multiple locations on the array and detecting any resulting fluorescence, wherein a later illuminated location is spatially closer to an earlier illuminated location than is a temporally intervening illuminated location lying on a same line as the later and earlier illuminated locations.

36. A computer program product according to claim 35 wherein at least one subsequently illuminated location is interleaved between previously illuminated locations.

37. A method according to claim 36 additionally comprising selecting a time between illuminating a location and illuminating a spatially closest later illuminated location based on a saturation characteristic of a fluorophore producing the fluorescence.

38. A computer program product, comprising: a computer readable storage medium having a computer program stored thereon which, when loaded into a computer communicating with an apparatus for reading fluorescence signals from an array of chemical moieties, performs the steps of:

illuminating multiple parallel lines across the array and detecting any resulting fluorescence from the array, wherein a later illuminated line is closer to an earlier illuminated line than a temporally intervening illuminated line.

39. A method according to claim 38 wherein each line comprises a series of points illuminated sequentially by moving an illuminating beam along the line.